



Department of Energy

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NOV 17 2017

Mr. Brian Jankauskas
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Environmental Conservation
Division of Environmental Remediation
625 Broadway -12th Floor
Albany, New York 12233

Ms. Jessica Mollin
Federal Facilities Section
Emergency and Remedial Response Division
U.S. EPA - Region II
290 Broadway – 20th Floor
New York, New York 10007-1866

Dear Mr. Jankauskas and Ms. Mollin:

SUBJECT: BROOKHAVEN NATIONAL LABORATORY (BNL) 2016
FINAL GROUNDWATER STATUS REPORT

Attached are two sets of replacement pages and disks for the 2016 BNL Groundwater Status Report for your files. These replacement pages were prepared based on comments received from the New York State Department of Environmental Conservation (NYSDEC)/New York State Department of Health (NYSDOH).

The following items are included in this submittal:

- Executive Summary pages xxi and xxii – Table E-1 was edited to fix issues with the justification of several values on the table. No values were edited.
- Text Section 3.2.4 pages 3-33 and 3-34 – Extraction well RW-17 was changed to EW-17 in Section 3.2.4.3.
- Text Section 3.2.12 pages 3-67 and 3-68 – Extra text "1,4-" removed from Section 3.2.12.2 and reference to Figure 3.0-3 added.

In their September 22, 2017 and October 18, 2017 letters of comment on the Draft 2016 Groundwater Status Report, the Suffolk County Department of Health Services (SCDHS) requested additional sampling for 1,4-Dioxane, Perfluorooctanesulfonic acid (PFOS), and Perfluorooctanoic acid (PFOA) be performed.

As both 1,4-Dioxane and PFOS/PFOA are emerging contaminants of concern across Long Island, and after further consideration and evaluation of options, we believe there is a benefit in obtaining baseline data on the distribution and concentrations of these contaminants in groundwater and in treatment system effluents associated with BNL.

The following is our approach to gather the data needed for planning purposes, and to address concerns associated with these emerging contaminants of concern:

1,4-Dioxane:

- One round of effluent sampling from the following operating groundwater treatment systems: Middle Road/South Boundary, Western South Boundary, Building 96 (RTW-1), Industrial Park, and LIPA/Airport systems. These are operating systems located in areas targeted for 1,4-Dioxane analyses in the initial effort based upon the presence of 1,1,1-Trichloroethane.
- Sampling of four representative monitoring wells within Operable Unit V.
- Sampling of one representative facility monitoring well downgradient of the Sewage Treatment Plant (STP) former sand filter beds.
- One sample collected from the STP effluent.
- Sampling of two representative monitoring wells downgradient of the Current and Former Landfills.
- Figure 1 identifies the location of the seven on-site monitoring wells to be sampled.
- Use United States Environmental Protection Agency (USEPA) analytical Method 522.

PFOS/PFOA:

- Install temporary groundwater monitoring wells upgradient of BNL supply wells where low level PFOS/PFOA concentrations were recently detected to determine whether PFOS/PFOA concentrations in the supply well capture zones are high enough to potentially impact future use or need for treatment prior to distribution.
- Brookhaven Science Associates will work with SCDHS and the Suffolk County Water Authority due to their experience with PFOS/PFOA sampling and analysis to develop sampling procedures required to prevent cross-contamination of groundwater samples during collection.
- Use USEPA analytical Method 537.

NOV 17 2017

Data gathered during this study will be summarized in a letter report and documented in the 2017 BNL Groundwater Status Report. A briefing of the planned sampling will be conducted at a future IAG teleconference. If you should have any questions please contact Jerry Granzen, of my staff, at (631) 344-4089.

Sincerely,



Frank J. Crescenzo
Site Manager

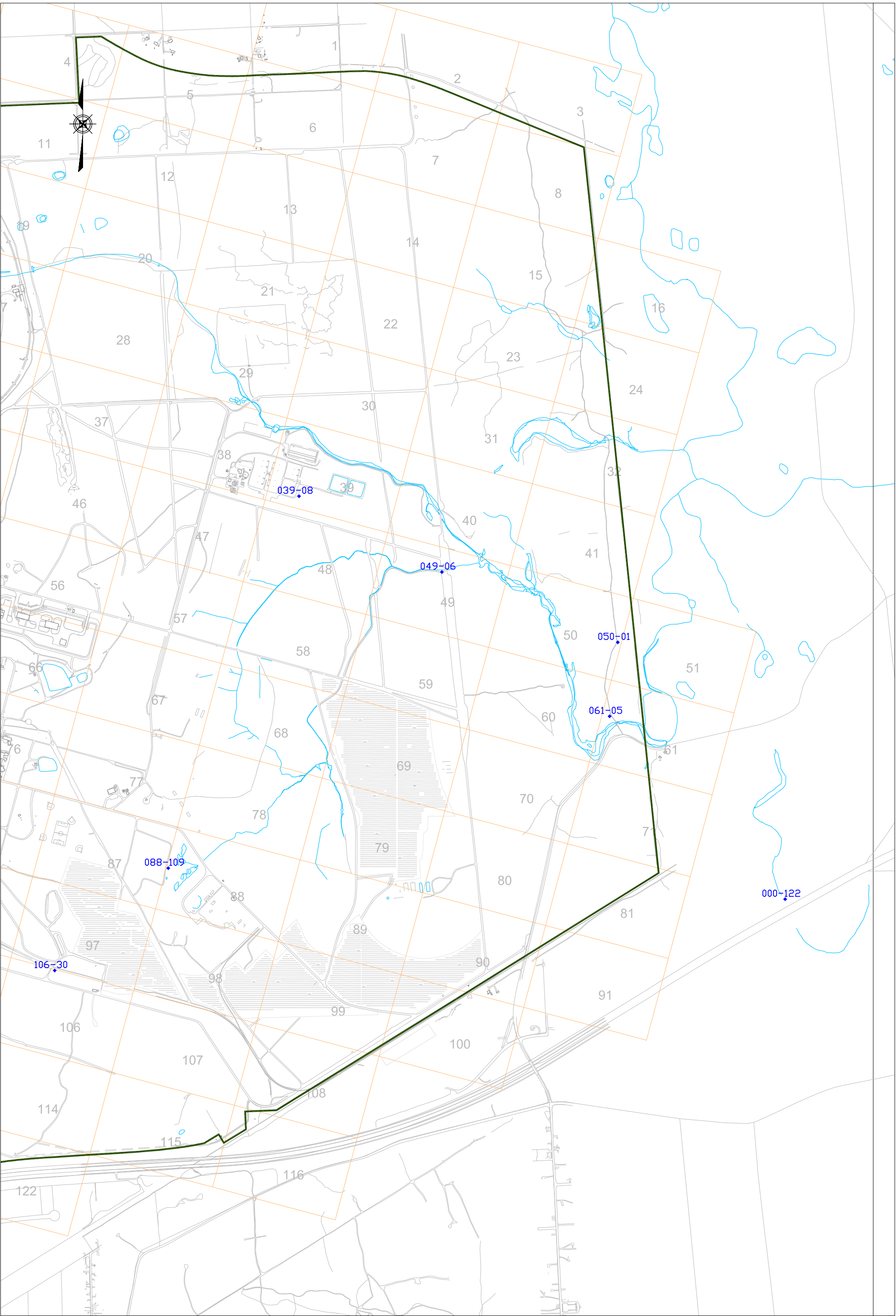
Attachments:

Replacement pages and disk for the 2016 BNL Groundwater Status Report

cc: A. Rapiejko, SCDHS
J. Collins, NYSDOH
S. Karpinski, NYSDOH
D. O'Hehir, NYSDOH

G. Granzen, SC-BHSO
W. Dorsch, BSA, w/o atts.
R. Howe, BSA, w/o atts.
J. Remien, BSA, w/o atts.

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TITLE:

PLANNED 2017 MONITORING
WELL SAMPLING PROGRAM FOR
1,4-DIOXANE
2017 GROUNDWATER PROTECTION GROUP

DWN:

JEB

VS: HS.:

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DATE:

11/9/17

PROJECT NO.:

20335

CHKD:

RH

APPD:

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REV.:

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NOTES:

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FIGURE NO.:

1

BNL Groundwater Protection Group
Responses to NYSDEC/NYSDOH Comments on 2016 Groundwater Status Report

Comment Number	Section	Comment	Response
Letter from Brian Jankauskas, NYSDEC to Frank Crescenzo, USDOE August 10, 2017.			
1	Section 3.2.4.3	Page 3-34, second bullet - Suggest changing RW-17 to EW -17.	The error has been corrected. See replacement pages.
2	Section 3.2.12.2	Page 3-67, Section 3.2.12.2 - After the first sentence suggest removing the "'1 ,4-". Within this section or within the previous sections regarding Central Monitoring, suggest referencing Figure 3.0-3 that shows the locations of the monitoring wells sampled for 1 ,4 dioxane so as not to be confused with the other two monitoring wells that were sampled near the William Floyd parkway Well Field. Suggest indicating if 1,4 dioxane was or was not detected at the William Floyd Parkway Well Field as part of the routine sampling conducted at the well field.	The error has been corrected and a reference to Figure 3.0-3 has been added. See replacement pages. Following our review of the Suffolk County Water Authority website, 1,4-Dioxane was not detected in the William Floyd Parkway Wellfield.

2016 BROOKHAVEN NATIONAL LABORATORY
GROUNDWATER STATUS REPORT

Executive Summary

The 2016 BNL Groundwater Status Report is a comprehensive summary of data collected during the 2016 calendar year supplemented with investigation data collected during the first quarter 2017, and an evaluation of Groundwater Protection Program performance. This is the twentieth annual groundwater status report issued by BNL. This document examines the performance of the program on a project-by-project basis.

GROUNDWATER RESTORATION (COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT - CERCLA)

Table E-1 summarizes the status and progress of groundwater cleanup at BNL under the provisions of CERCLA. During 2016, nine volatile organic compound (VOC) groundwater remediation systems were in operation, along with two strontium-90 (Sr-90) treatment systems. In 2016, 63 pounds of VOCs were removed from the aquifers by the treatment systems. To date, 7,455 pounds of VOCs have been removed from the aquifers. The Sr-90 treatment systems removed 0.83 milliCuries (mCi) of Sr-90 from the Upper Glacial aquifer in 2016, for a total of 31.72 mCi since operations began.

A significant cleanup milestone was achieved in early 2016 with regulatory approval of the petition for shutdown of the Building 452 Freon-11 Treatment System. Groundwater remediation activities for the remaining plumes will continue until the cleanup objectives for the plumes are met. The specific goals are as follows:

- Achieve maximum contaminant levels (MCLs) for VOCs in the Upper Glacial aquifer by 2030
- Achieve MCLs for VOCs in the Magothy aquifer by 2065
- Achieve the MCL of 8 pico Curies per liter (pCi/L) for Sr-90 at the BGRR in the Upper Glacial aquifer by 2070
- Achieve the MCL of 8 pCi/L for Sr-90 at the Chemical/Animal Holes in the Upper Glacial aquifer by 2040

The cleanup objectives will be met by a combination of active treatment and natural attenuation. The comprehensive groundwater monitoring program measures remediation progress.

SER VOLUME II: GROUNDWATER STATUS REPORT

Table E-1.
BNL Groundwater Remediation System Treatment Summary for 1997 – 2016.

	1997 – 2015		2016	
	Water Treated (gallons)	VOCs Removed (pounds)(c)	Water Treated (gallons)	VOCs Removed (pounds)(c)
OU I South Boundary (Dec. 1996) (a)	4,177,473,000	369	0	0
OU III Carbon Tetrachloride (Oct. 1999) (e)	153,538,075	349	Decommissioned	0
OU III Building 96 (Feb. 2001)	450,986,416	138	12,702,000	2
OU III Building 452 Freon-11 (March 2012)	111,753,000	102	6,768,000	3
OU III Middle Road (Oct. 2001)	2,990,831,550	1,175	106,686,240	20
OU III South Boundary (June 1997)	4,840,683,850	3,014	94,083,100	13
OU III W. South Boundary (Sept. 2002)	1,482,620,000	130	104,767,000	5
OU III Industrial Park (Sept. 1999)	2,185,201,330	1,067	177,722,000	4
OU III Industrial Park East (May 2004)(f)	357,192,000	38	Decommissioned	0
OU III North Street (June 2004)	1,645,686,000	341	35,256,000	1
OU III North Street East (June 2004)	1,009,798,000	44	0	0
OU III LIPA/Airport (June 2004)	2,720,980,000	410	203,771,240	15
OU III HFBR Tritium Plume (May 1997) (a)	721,795,000	180	0	0
OU IV AS/SVE (Nov. 1997)	NA (b)	35	Decommissioned	0
OU VI EDB (August 2004)	1,764,852,300	NA(d)	171,959,000	NA (d)
Totals	24,613,390,521	7,392	914,954,580	63

	2003 – 2015		2016	
	Water Treated (gallons)	Sr-90 Removed (mCi)	Water Treated (gallons)	Sr-90 Removed (mCi)
Sr-90 Remediation (start date)				
OU III Chemical Holes (Feb 2003)	59,790,436	4.89	3,597,000	0.03
OU III BGRR (June 2005)	107,333,000	26	19,094,800	0.8
Totals	167,123,436	30.89	22,691,800	0.83

Notes:
(a) System was placed in standby mode in 2013.
(b) Air Sparging/Soil Vapor Extraction (AS/SVE) system performance measured by pounds of volatile organic compounds (VOCs) removed. System was decommissioned in 2003.
(c) Values rounded to the nearest whole number.
(d) Ethylene dibromide (EDB) has been detected in the system influent since 2009 at levels slightly above the standard. Therefore, no removal of VOCs is reported.
(e) System was decommissioned in 2010.
(f) System was decommissioned in 2014.
NA – Not applicable

The locations and extent of the primary VOC and radionuclide plumes at BNL, as of December 2016, are summarized on **Figures E-1** and **E-2**, respectively. Significant items of interest during 2016 and early 2017 include:

- 547 monitoring wells were sampled as part of the CERCLA Groundwater Monitoring Program, comprising a total of 1,460 groundwater samples. In 2016/2017, 34 temporary wells were also installed and sampled.

3.2.4 OU III South Boundary Treatment System

This section summarizes the operational data from the South Boundary Treatment System for 2016, and gives conclusions and recommendations for future operation. Also included within this section is an evaluation of the extraction and monitoring well sampling data.

3.2.4.1 System Description

This system began operation in June 1997. It utilizes air-stripping technology for treatment of groundwater contaminated with chlorinated solvents. There are eight extraction wells. The system is currently operating at a pumping rate of approximately 181 gpm, utilizing two extraction wells. Extraction wells EW-12 and EW-8 were placed on standby in October 2003 and October 2006, respectively, due to low VOC concentrations. Wells EW-6 and EW-7 were placed in standby mode in November and December 2007, respectively. Extraction well EW-17 was added to the system during 2012. Wells EW-3 and EW-5 were placed in standby in October 2015. The system is currently operating with just wells EW-4 and EW-17. A complete description of the system is included in the *Operation and Maintenance Manual for the OU III Middle Road and South Boundary Groundwater Treatment Systems, Revision 2* (BNL 2014a).

3.2.4.2 Groundwater Monitoring

The monitoring well network consists of 45 wells and was designed to monitor the VOC plume(s) in this area of the southern site boundary, as well as the efficiency of the groundwater remediation system (**Figure 3.2.4-1**). The South Boundary wells are sampled and analyzed for VOCs at frequencies detailed on **Table 1-5**. A number of OU III South Boundary wells are also analyzed for radionuclides as detailed in **Section 3.2.14**.

3.2.4.3 Monitoring Well Results

The south boundary segment of the OU III VOC plume continued to be bounded by the existing monitoring well network. VOCs were detected in the deep Upper Glacial aquifer in the vicinity of the site boundary, as depicted on **Figure 3.2-2**, **Figure 3.2.3-4**, **Figure 3.2.4-1**, and **Figure 3.2.4-2**. **Appendix C** has the complete groundwater monitoring results for 2016.

The plume core wells continued to show the same trend of decreasing VOC concentrations that were observed following the start-up of the treatment system in 1997, except for several key wells located in the deep Upper Glacial aquifer in the vicinity of wells EW-4 and EW-17. The bulk of the VOC contamination in this area is currently located immediately upgradient of wells EW-4 and EW-17, as can be seen on **Figure 3.2.4-2**, which is a cross section (G-G') drawn along the south boundary. The VOC concentration trends for specific key wells are shown on **Figure 3.2.3-3**. Results for key monitoring wells are as follow:

- Western perimeter well 121-08 had a TVOC concentration of 5 µg/L in October and eastern perimeter well 114-07 had a concentration of <0.5 µg/L in November. Individual VOC concentrations in the remaining plume perimeter wells were less than 5 µg/L in the fourth quarter of 2016.
- Bypass detection well 121-43 located several hundred feet south of extraction wells EW-4 and EW-17 had shown elevated levels of VOCs. In April 2011 the TVOC concentration was 338 µg/L and has steadily declined to 9µg/L in November 2016. Extraction well EW-17 was installed to address the high VOC concentrations that had been observed in well 121-43 (**Figure 3.2.4-1**) and began operations in July 2012.
- Three monitoring wells were installed to monitor the performance of extraction well EW-17. They are 121-47 a western perimeter well, 121-48 an eastern perimeter well and 121-49 located upgradient of this well. The upgradient monitoring well 121-49 showed high TVOC concentrations in 2016 with the highest concentration in July of 718 µg/L.

- Monitoring well 121-45 was installed to monitor the higher VOC concentrations present at wells 113-17 and 113-11. This well is located between the Middle Road and South Boundary systems. TVOC concentrations were at 34 µg/L in October. This continues a downward trend in TVOC concentrations in this monitoring well.
- Well 121-54 was installed to monitor VOC concentrations upgradient of extraction well EW-17. This well had TVOC concentrations of up to 193 µg/L in April 2016. Well 121-53 was also installed upgradient of EW-17 and it showed a peak TVOC concentration of 138 µg/L in July.
- Plume core well 121-11 is upgradient of EW-3. TVOC concentrations were 22 µg/L in November.
- Plume core well 122-05 is a Magothy monitoring well west of EW-8. TVOC concentrations have been showing a decreasing trend with a concentration of 10 µg/L in November 2016.
- Following a request from NYSDEC, a one-time sampling event for 1,4-dioxane of 22 monitoring wells on and off of BNL property that have or had detected TCA was performed in January 2017. To achieve a lower level of detection, analytical Method 522 was used. Of the two monitoring wells sampled for the OU III South Boundary project, the first well (121-48) detected 1,4-dioxane up to 4.71 µg/L. The second well (121-49) detected 1,4-dioxane up to 5.01 µg/L.

Table 3.2.4-1.
OU III South Boundary Air Stripping Tower
2016 SPDES Equivalency Permit Levels

Parameters	Permit Limit* (µg/L)	Max. Observed Value (µg/L)
pH range (SU)	6.5 – 8.5	6.6–7.2
carbon tetrachloride	5	<0.5
chloroform	7	<0.5
dichlorodifluoromethane	5	<0.5
1,1-dichloroethane	5	<0.5
1,1-dichloroethylene	5	<0.5
methyl chloride	5	<0.5
tetrachloroethylene	5	<0.5
toluene	5	<0.5
1,1,1-trichloroethane	5	<0.5
1,1,2-trichloroethane	5	<0.5
trichloroethylene	10	<0.5

Notes:

*Maximum allowed by requirements equivalent to a SPDES permit. Required sampling frequency is monthly for VOCs and pH.

SU – Standard units.

These detections are below the existing State standard for non-specific organic contaminants of 50 µg/L. See Table 3.0-2 for the complete data set.

3.2.4.4 System Operations

The individual extraction wells are sampled quarterly and analyzed for VOCs. The effluent sampling parameters of pH and VOCs are done monthly, in accordance with SPDES equivalency permit requirements (Table 3.2.4-1). In addition, samples are analyzed for tritium with each system-sampling event. Tritium from these samples continues to be non-detect. Effluent VOC concentrations from the treatment system during this period of operation were below equivalency permit requirements.

System Operations

In 2016, approximately 94 million gallons of water were treated by the South Boundary System. Well EW-12 has not been sampled since April 2012. This is because the installation of well EW-17 utilized some of the equipment from this well. In the unlikely event this well is needed, a modification could be made to make this well operational. This determination will be made based on the monitoring well data in the

vicinity of EW-12.

January – September 2016

Approximately 92.5 million gallons of water were pumped and treated. Extraction well EW-17 was off for three weeks for maintenance. The system was down for five days in February for maintenance. In April, well EW-4 and EW-17 were off for one week for maintenance. In May, the

3.2.12 Central Monitoring

The OU III Remedial Investigation (RI) identified several low-level (less than 50 µg/L TVOC) source areas and nonpoint contaminant sources within the developed central areas of the BNL site. Because the sources are not large enough to warrant a dedicated monitoring program, they were monitored under the OU III Central Monitoring Program. In addition, this program includes wells 109-03 and 109-04, located near the BNL western site boundary. These wells were installed by the Suffolk County Department of Health Services (SCDHS) to serve as sentinel wells for the SCWA William Floyd Parkway Well Field. Based on the recommendation in the *2015 Groundwater Status Report*, sampling of the monitoring wells was discontinued except wells 109-03 and 109-04.

3.2.12.1 Groundwater Monitoring

Well Network

The monitoring well network is comprised of two wells (**Figure 3.2.12-1**).

Sampling Frequency and Analysis

Wells 109-03 and 109-04 are analyzed quarterly for VOCs, gamma spectroscopy, tritium, and Sr-90 (**Table 1-5**) and split samples are analyzed by the SCDHS.

3.2.12.2 Monitoring Well Results

No VOCs were detected above AWQS. The highest VOC detected was 1.2 µg/L of toluene in well 109-04. Radionuclides were not detected in any of the samples collected from wells 109-03 and 109-04 during 2016.

Following a request from NYSDEC, a one-time sampling event for 1,4-dioxane of 22 monitoring wells (**Figure 3.0-3**) on and off of BNL property that have or had detected TCA was performed in January 2017. Two monitoring wells that had sampling discontinued based on the recommendations in the *2015 Groundwater Status Report*, were sampled for 1,4-dioxane based on historic data. Well 065-02 was non-detect for 1,4-dioxane. Well 084-04 reported a result of 2.04 µg/L of 1,4-dioxane. This detection is below the existing State standard for non-specific organic contaminants of 50 µg/L. See **Table 3.0-2** for the complete data set.

3.2.12.3 Groundwater Monitoring Program Evaluation

The evaluation of the OU III Central Monitoring Program is based on the decision rule established for this program using the groundwater DQO process.

1. Have the SCWA William Floyd Well Field sentinel wells remained below the MCLs?

Yes During 2016, no VOCs or radionuclides were detected at concentrations exceeding the MCLs.

3.2.12.4 Recommendation

No changes are recommended for the OU III Central Monitoring Program.

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